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EFFECT OF SMOKING ON ERYTHROCYTE SEDIMENTATION RATE, BLEEDING TIME AND CLOTTING TIME OF YOUNG ADULTS

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Abstract

Introduction: Smoking is one of the most preventable causes of death in our society. Smoking tends to cause a rise in the mean ESR.

Objectives: To compare the Erythrocyte sedimentation rate, bleeding time and clotting time of smokers and non smokers.

Methods: 100 young adult smokers and non smokers who were of the age group of 20-30 years were selected for this study. Subjects suffering from any disease were excluded. The methods used for this study were- Duke's method for determination of bleeding time; Capillary glass tube method for determination of clotting time and Wintrobe's method for determination of erythrocyte sedimentation rate.

Results: In the present study, the bleeding time of non-smokers and passive smokers was not statistically significant. The mean of bleeding time in active smokers (<10 cigarettes/day) was equal to bleeding time of passive smokers. In active smokers (>10 cigarettes/day) it was slightly lower than non-smokers, but it was not significant. The clotting time of non-smokers was slightly higher than passive smokers. The clotting time of active smokers (<10 cigarettes/day) and active smokers (>10 cigarettes/day) were slightly higher than non-smokers, but the difference was not statistically significant. The erythrocyte sedimentation rate of occasional and passive smokers was slightly higher than non-smokers but the difference was statistically insignificant. The mean of ESR of active smokers (<10 cigarettes /day) and active smokers (>10 cigarettes /day) was higher than non-smokers and it was statistically significant.

Conclusion: This study showed that smoking had a significant effect on erythrocyte sedimentation rate. A significant increase in ESR was observed in active smokers (>10 cigarettes/day) and active smokers (<10 cigarettes /day), while no significant difference was observed in passive smokers and occasional smokers. The mean of bleeding time and clotting time did not show significant difference in smokers and non-smokers.

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Introduction:

Tobacco smoking is the second cause of death in world. It is currently responsible for death of one in ten adult worldwide (about 5 million death each year).[1] The expert committee observed that tobacco related diseases are on rise in developing countries.[2]

Smoking is one of the most preventable cause of death in our society. The chemicals in cigarette and tobacco smoke make it harmful. Tobacco smoke contains over 4000 chemicals. At least 50 are known carcinogen and many are poisonous. There are believed to be 1.1 million smokers in the world.[3] It had been found that cigarette smoking induces endothelial damage by producing free radicals such as nitric oxide and hydrogen peroxide. This oxidative stress promotes a systemic acute phase reaction thus increasing inflammatory cytokines, C-reactive protein (CRP), fibrinogen, blood cell count, whole blood viscosity and rouleaux formation. Eventually this leads to rise in erythrocyte sedimentation rate (ESR) values.[4]

Pincherle and Shanks added in his study that smoking tended to cause a rise in the mean ESR; this was a progressive trend with increasing amounts smoked and was statistically significant.[5]

It had been found in paired studies on seven male subjects under metabolic ward conditions, platelet survival was significantly shorter and platelet turnover correspondingly greater when the subjects were habitually smoking than when they were not smoking at all. This was associated with only minor changes in blood coagulation or blood lipid levels.[6]

A study was made to attempt to identify the immediate effects of smoking on healthy young college men. In the first phase of the study, 200 smokers were compared with 200 non-smokers concerning their differences in knowledge about smoking, health, in religious activities, academic experiences and social relationships. Protest differences were found in certain clinical tests. Smokers had faster blood clotting times after smoking than non-smokers and were less efficient during work tasks; however, the differences in clotting time and in work efficiency between smokers and non-smokers were not statistically significant.[7]

Kampman and Hornstra studied the influence of cigarette smoking on blood platelet function, bleeding time was measured in two groups of 14 habitual smokers before and after a 20-minute period during which the subjects either smoked two cigarettes (experimental group) or rested (control group). The second bleeding time appeared to be slightly shortened upon cigarette-smoking (-0.1 min) and was found to be prolonged in the control group (+0.4 min). These changes did not differ significantly from each other (P = 0.38). Consequently, bleeding time of habitual smokers are not affected by smoking two cigarettes.[8]

Materials & Method:

Subjects: 100 smoker and non-smoker young adults between 20-30 years of age group were taken for this study. Out of 100, 50 were smokers (who were smoking cigarettes since last 3 years), and 50 were non smokers. Subjects suffering from any disease were excluded.

An informed consent was taken from the participants before the study was started and the study was approved by the institutional ethics committee.

Subjects were divided into two major groups: Smokers and Non-smokers. Non-smokers were further divided into following sub groups: Non-smokers and Passive smokers. The smokers were further divided into following sub groups: Occasional Smokers, Active smokers <10 cigarettes /day and Active smokers >10 cigarettes /day

Collection of Sample:

For the determination of ESR, the sample was intravenous blood. The sample was taken of the both groups from the medial cubital vein. The sample (blood) was taken in a blood container and EDTA (ethylene-di-amine-tetra-acetate) anticoagulant was added to prevention of clotting.

For the determination of bleeding time and clotting time arterial blood was used.

Following methods were used for this study –

1. Wintrobe's method for determination of ESR
2. Duke's method for determination of Bleeding Time
3. Capillary Glass Tube method for determination of Clotting Time

Wintrobe's method for ESR determination

Wintrobe's tube was filled with anticoagulant blood up to '0' mark with the help of long nozzle needle. Then the tube was placed vertically in its rack for one hour. The reading of

the upper layer of RBCs was taken at the end of first hour.[9]

Duke's method for determination of Bleeding Time-

The stop was set at zero. The tip of the finger was cleaned thoroughly with the spirit and allowed to dry. A deep puncture was made to ensure free flow of blood without squeezing. Meanwhile the stop watch was starts or the time was noted down. After 30 seconds releasing blood was dried on the edge of filter paper. The procedure was repeated in every thirty seconds using a fresh area of filter paper on each occasion till the bleeding ceased and no further blood spot appeared on the filter paper. Therefore, each blot of blood on the filter paper was counted and multiplied by ½. It gave the bleeding time in minute unit.[10]

Capillary Glass Tube method for determination of Clotting Time-

The stop was set at Zero. The tip of finger was cleaned thoroughly with sprit and allowed to dry. Now a deep puncture was made to make sure the free flow of blood. As a large drop of blood was collected, the one end of the thin capillary was introduced in to the drop holding the tube in such a way that as its end should be at lower level. Blood flow rapidly into the capillary tube. The capillary tube, filled with blood was holds between the palms as maintain it at the body temperature. After one minute about 1 cm. of the tube was broken off and was noticed if the thread of fibrin connected the broken ends of the tube. If there was no fibrin thread the procedure was repeated after every thirty seconds till a fibrin thread appears. The total time taken from the puncture till the forming of fibrin thread was noted down as clotting time.[10]

Analysis of Data-

Results were analyzed by unpaired Student's 't' test to compare each smoking group with the non-smoking group.

The P values represent probability values for testing the simultaneous equality of the means and P values below 0.05 were considered to be statistically significant. The values of all the parameters were presented as geometric means.

Statistical software namely SPPS10.0 and Systat 8.0 were used for the analysis of the data. Microsoft word and Excel have been used to generate graphs, tables, etc.

Results:

The Erythrocyte Sedimentation rate in passive smokers was 3.87 mm and in occasional smokers it was 4.07 mm. It was slightly higher than the mean of ESR of non smokers which was 3.73 mm and not statistically significant. ESR in active smokers < 10 cig./day was 5.80 mm. and in active smokers > 10 cig./day it was 6.13 mm. The ESR in active smokers < 10 cig./day and active smokers > 10 cig./day was significantly higher than non smokers. [Table-1]

The Bleeding time of non smokers was 3.46 minutes and in passive smokers it was 3.433 minutes. It was not statistically significant (p=0.9161). The mean of BT in occasional smokers was 3.30 minutes and not statistically significant (p=0.5462). The bleeding time in non smoker < 10 cig./day was equal to the bleeding time of passive smokers. In active smokers > 10 cig./day was slightly lower than non smokers and this difference was not statistically significant (p=0.3845). [Table-2]

The Clotting time of non smokers was slightly higher than passive smokers and not statistically significant (p=0.5062). The clotting time of occasional smokers was also not different from the non smokers (p=0.7165).The mean of clotting time of active smokers < 10 cig./day was 3.133 minutes and of active smokers > 10 cig./day it was 3.5 minutes. These values are slightly higher than non smokers but not statistically significant. [Table-3]

Discussion:

In the present study we have investigated the changes in bleeding time, clotting time and erythrocyte sedimentation rate in non-smokers and smokers, who were aged 20 -30 years. The mean of different parameters of non smokers are compared with the mean of passive smokers, occasional smokers, active smokers (<10 cig. /day and >10 cig /day).

G. Pincherle and J. Shanks observed in his study that Smoking causes a rise in the mean Erythrocyte Sedimentation Rate; this was a progressive trend with increasing amounts smoked

and was statistically significant. The effect of smoking on Erythrocyte Sedimentation Rate in the present study is similar to the previous study.[5]

In this study the Bleeding time of non smokers was 3.46 and in passive smokers it was 3.433. It was not statistically significant. The mean of BT in occasional smokers was 3.30 and not statistically significant (p=0.5462). The bleeding time in non smoker < 10 cig./day was equal to the bleeding time of passive smokers. In active smokers > 10 cig./day was slightly lower than non smokers and this difference was not statistically significant. Kampman MT and Hornstra G were observed that the mean bleeding time of neither the non-smokers nor the habitual smokers changed significantly after smoking. Smoking cigarettes has no effect on the Bleeding time of healthy men.[8]

In the present study the clotting time of Passive smokers, occasional smokers, Active smokers <10 cig./day and Active smoker >10 cig./day was slightly higher than non-smokers but the difference was not statistically significant. Fodor JD et al. were observed that smokers had faster blood Clotting time after smoking than non-smokers and the differences in Clotting time between smokers and non-smokers were not statistically significant.[7]

Our study is also in consonance with Hunter et. al. and Kannel WB et. al. who conclude that use of tobacco, raises the risk of thrombosis due to effect of tobacco on fibrinogen level and increase platelet aggregation.[11,12]

Davis RF et. al. found that the mean bleeding time of neither non smokers nor habitual smokers changes significantly after experimental smoking.[13]

Islam MM conclude that the erythrocyte sedimentation rate was significantly (p<0.01) differ between smokers and non smokers but it did not significantly differ with intensity of smoking[14]**.** While according to Wolfe F no effect of smoking was seen on erythrocyte sedimentation rate.[15]

Conclusion: From the overall study it may be concluded that the smoking has its effect on blood parameters. A significant increase in ESR was observed in active smokers < 10 cig./day and Active smokers > 10 cig./day. While no significant difference was observed in passive smokers and occasional smokers. But there was no such significant difference was observed in bleeding time and clotting time between smokers and non smokers.

Table 1: Comparison of Erythrocyte Sedimentation Rate in non smokers and smokers-

GROUP	MEAN (m.m.)	RANGE	STANDARD DEVIATION
Non Smoker	3.73	01 – 13	±3.41
Passive Smoker	3.87	02 – 06	±1.41
Occasional Smoker	4.07	01 – 10	±2.26
Active Smoker <10	5.80	03 - 08	±1.47*
Active Smoker >10	6.13	03 – 12	±2.36*

(* Statistically significant)

Table-2: Comparison of Bleeding Time in non smokers and smokers –

GROUP	MEAN (minutes)	RANGE	STANDARD DEVIATION
Non Smoker	3.467	2:00- 5:00	±0.876
Passive Smoker	3.433	2:00 – 4:30	±0.842
Occasional Smoker	3.30	2:30 – 4:00	±0.592
Active Smoker <10	3.433	2:30 – 4:30	±0.792
Active Smoker >10	3.20	2:30 – 4:30	±0.775

Table-3: Comparison of Clotting Time in non smokers and smokers –

GROUP	MEAN (minutes)	RANGE	STANDARD DEVIATION
Non Smoker	3.00	1:30 – 4:30	±1.00
Passive Smoker	3.267	1:30 – 5:00	±1.163
Occasional Smoker	3.133	1:30 – 4:30	±0.990
Active Smoker <10	3.133	1:30 – 5:00	±1.187
Active Smoker >10	3.50	1:30 – 5:00	±1.165

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